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CONTENTS

Discoveries and Current Events. — The Netherlands: The Colorado Beetle (*Leptinotarsa decemlineata*) in 1941, p. 49.

Various Questions. — The Mineral Intake and the Resistance of Plants to Microbial Diseases (*continued*), p. 50.

Legislative and Administrative Measures. — Germany, p. 55. – Germany (Alsace), p. 55. – Germany (Protectorate of Bohemia and Moravia), p. 56. – Germany (Western Prussia – Dantzig District), p. 56. – Germany (Government General), p. 56. – Chile, p. 56. – Colombia, p. 56. – Denmark, p. 57. – Morocco (French Zone), p. 57. – Peru, p. 57. – Portugal, p. 58. – Sweden, p. 58.

Recent Bibliography, p. 58.

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1942

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ACTIVITY OF THE INTERNATIONAL INSTITUTE OF AGRICULTURE

March Session of the Permanent Committee. — The Permanent Committee of the International Institute of Agriculture met under the chairmanship of Baron Acerbo for the purpose of dealing with the proceedings of the spring meeting.

The Delegates of the following countries were present: Germany, Argentina, Bulgaria, Chile, Colombia, Denmark, Spain, Finland, Hungary, Eire, Iran, Italy and its Possessions, Japan, Paraguay, Portugal, Rumania, San Marino, Slovakia, Sweden, Switzerland.

In agreement with the opinion of the Governments, consulted in the matter, the Permanent Committee decided to postpone the XVIth General Assembly, which normally would have been held next May, to a subsequent date which will be established after cessation of present hostilities.

Based on the report presented by the Commission for publications, the Permanent Committee passed various Resolutions in regard that the level attained by the publications of the Institute, which constitute the outward proof of its vitality, be maintained and increased.

The Committee discussed other important matters including a report of the President relative to the duties of the Institute insofar as regards the social problems of agriculture, chiefly from the aspect of post-war world reconstruction.

The reports of the Secretary General and the Finance Committee indicate that the Institute, always sustained by the assurance and active participation of a considerable number of countries and, despite the abnormal conditions of today, continues its work efficaciously both as an international information centre and as an authoritative organization for the preparation of measures tending to agricultural progress and the improvement of the status of the rural population.

In conclusion the Permanent Committee approved the report on the activity of the International Forestry Centre, expressing the greatest satisfaction as regards the work of this organization and the manner in which it is carried out.

International Forestry Centre. — Croatia having agreed to adhere to the Centre on October 1, 1941, the said Centre now includes the following States: Germany, Bulgaria, Croatia, Denmark, Spain, Finland, France, Hungary, Italy, Mexico, Norway, The Netherlands, Rumania, Slovakia, Sweden, Switzerland and Turkey.

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INTERNATIONAL BULLETIN
OF PLANT PROTECTION

1942 No. 4

DISCOVERIES AND CURRENT EVENTS *

THE NETHERLANDS.

The Colorado Beetle (*Leptinotarsa decemlineata*) in 1941 †

In the Netherlands, the Colorado beetle situation in 1941 was about the same as in 1940. It was only to the south of the Meuse (exception being made for two foci north of the Rhine) that the insect was reported in 59 communes (in 1940, 119) of which 51 (in 1940, 44) may be considered as foci. In comparison with the year 1938 when the respective figures were 161, 607 and 224, the situation is very favourable.

Control operations were carried out as in the previous years, that is, trap plants on the foci of the preceding year and careful watch maintained for over two months; intensive control of potato fields and three sprayings with a 0.4 per cent. solution of calcium arsenate in the region south of the Rhine; complete eradication in all districts where the Colorado beetle has been reported.

The efficacy of the eradication of foci the previous year by the control measures applied is proved by the fact that only in two foci, 1 and 4 insects respectively were captured on the trap plants.

Spraying was effected during the following periods: June 30-July 8, July 17-26 and August 1-9. The quantity of calcium arsenate placed at the disposal of the farmers amounted to 491,000 kg. Spraying was supervised by 122 inspectors. Expenses totalled approximately 231,000 florins.

The Colorado beetle was first observed on June 9; the first oviposition took place on June 21 and the last on August 14. The first generation made its appearance on August 6 and 9; no second generation was reported.

* Under this and the third heading the countries are arranged in French alphabetical order.

† Comunication from the Phytopathological Service of the Netherlands, Wageningen, official correspondent of the Institute.

VARIOUS QUESTIONS

The Mineral Intake and the Resistance of Plants to Microbial Diseases (*continued*) *

The mineral elements participating in the physiological functions of the plant in the state of organomineral compounds.

The chlorosis produced by a deficiency in mineral elements disappears automatically if the element which is wanting is intriduced into the nutrient solution. This mode of treatment, alaways effective, is not original and teaches us nothing new. A more direct and instructive method consists in bringing the remedy into contact with the cells which, by their aspect, show deficiency symptoms.

Proceeding thus, it is known that the soluble compounds of iron and sulphur in solution at 10^{-4} or 2×10^{-4} applied with a dropper to leaves rendered chlorotic through iron or sulphur deficiency, turns the parenchyma green after a day's exposure to the sun. When dilute solutions are employed, the green patch does not exceed the limits of the drop; the cells which have fixed the iron or sulphur do not cede them to the neighbouring cells. The elements, therefore, are retained by the protoplasm which utilizes them in the chemical transformations of photosynthesis, as they cause the chlorophyll to appear although they do not enter into its composition.

This is not the case when the plant is subjected to a deficiency in Mn, Zn, Bo, etc. Weak solutions of their mineral compounds placed in drops on etitolated leaves do not cause any formation of chlorophyll on exposure to the sun. The discoloured cells, therefore, cannot assimilate them in the state of mineral compounds, as on absorbing them, they do not resume their physiological activity. This does not mean to say that their direct assimilation is not possible by cells less severely affected by the deficiency in question; it is the contrary which is true: spraying with a solution of the wanting element carried out in time prevents the discoloration of the leaves and the death of the plant. This is of considerable practical importance; it is the following, however, which is very instructive.

If on the discoloured leaves is placed a drop of exudate (nocturnal sudation) or of the cellular sap taken from a normal plant, the green colour appears after a day in the sun.

The patch goes beyond the limits of the drop of liquid and spreads first in the direction of the ascending sap up to the tip of the leaf, then in the other direction towards the base. The intensity of the reaction depends on the stage of chlorosis; it is less striking when very badly discoloured leaves are tried.

* Note of Prof. PIERRE MAZÉ, Pasteur Institute, Paris, France.

The cellular sap and the exudate contributed the wanting elements in a directly assimilable state which is the organomineral state, the mineral salts having no effect.

It follows that a mineral deficiency of any sort places the plant or more generally the living cell, in the impossibility of elaborating the organic support by which it stimulates and regulates the biochemical properties of the mineral elements.

Another fact should be mentioned: this is the specificity of this reaction: the exudate or cellular sap of other gramineous species have no effect on chloroses produced by mineral deficiencies other than those due to want of iron or sulphur. This specificity is worth studying; it would be easily explainable if there were proteins, but the organominerals in question are not proteins as they can be heated beyond 100°C. without being rendered inactive; it is justifiable, therefore, to admit that it is a case of a mixture of compounds, each of which taken separately is incapable of ensuring the resultant effect. One of the associated compounds would contain the missing element. The deficiency of a mineral element may, in fact, cause disturbances which are not limited to the disappearance of the one organic compound which serves as support; it is probable that the chemical capacity of a cell lacking in an element is attained on many points when chlorosis is perceptible. These are the different deficiencies which normal cell sap alone, acting as a blood transfusion, can cause to disappear simultaneously. Furthermore, examples of these reactions by impulse are not lacking. Deficiency in iron or sulphur leads to the complete disappearance of the chlorophyll and even of carotene, if the sunlight is very strong and the temperature very high. Chlorophyll, however, does not contain iron nor sulphur; if it disappears, it is due to another phenomenon which I consider as a reaction of protection against an excessive rise in temperature in the isolated cells incapable of utilizing the solar energy collected by the green and yellow pigments.

The organomineral compounds considered above disappear in normal plants in the course of a series of wet and cold days.

In reproducing under different conditions the experiments which I have just recalled, facts stand out which at first sight may seem surprising: the cellular sap and the exudate of leaves lose, after a series of cold and rainy days, the property of causing the parenchyma, discoloured through mineral deficiency to turn green again.

The organomineral substances considered here, therefore, are utilized by the plant as temporary reserves and disappear completely when atmospheric conditions more or less check the photosynthetic activity of the leaves.

In this state of physiological poverty, the cell loses some of its properties; it recuperates them, as can easily be verified, after a few days of fine weather. It may be noted, by the way, that the influence of bad weather, the mechanism of which we have just considered experimentally, prepares the way for microbial infections; there will be frequent occasion to recall this preliminary remark.

Other properties of normal cellular sap. Resistance of plants to microbial infections.

The treatment of the effects of experimental intoxication due to the heavy metals Pb, Ag, Hg, etc. with the cellular sap of normal leaves causes etiolated leaves to again turn green after a day or two of exposure to the sun; the procedure is identical with that followed in the treatment of mineral deficiencies.

It was also from the external aspect of an intense chlorosis that I discovered two unexpected cryptogamic infections which occurred during the course of my studies on mineral intake.

In a tank of maize which should have grown normally, suddenly one plant showed abnormal chlorosis. This was due to accidental contamination of the plant by a colony of *Aspergillus niger*; it had developed on the surface of the solution and surrounded the stem below the first node. The mycelium having succeeded in penetrating the vascular bundles, appropriated for its own use all the iron absorbed by the roots, as the chlorosis in this case was due to want of iron.

The disease appeared during a period of rainy days; when fine weather returned, the chlorosis disappeared quicker than when it occurred. The same incident was observed two years later under the same conditions and with the same result. The causes and effects being thus reproduced identically, their temporary interpretation, after what we know, is easy.

A habitual saprophyte has become an occasional parasite because it takes advantage of the want of resistance of the plant due to adverse weather; it is easily eliminated with the return of fine weather as the plant has elaborated anti-microbial substances with which it was temporarily deprived; the sap having brought these substances into contact with the parasite, the latter was rapidly placed in the position of being unable to exist.

Thus we now have two series of experimental diseases: disorders due to mineral deficiency and microbial diseases. That these have arisen contemporaneously is just chance, but a relative chance as both recover by the same curative methods: the properties of normal cellular sap.

It only remains to submit the proposed interpretations to practical proof. *

Development of maize smut (*Ustilago maydis*).

The occasion arose about 1927. The field utilized for producing the seeds required in my experimental investigations had not had any organic fertilizer since 1900. Formerly grown to truck crops, the soil is sand from the valley of the Seine supplemented with limestone and very rich in humus.

* The facts which are now going to be summarized appeared in the *Comptes rendus des séances de la Société de Biologie* (Paris) from 1927 to 1941 in the from of brief notes; a provisional summing up on the subject of the present note had already been published in the same reports in 1916 (t. 79, p. 1059).

Towards 1920, only maize was grown. The size of the plot is only 19 m² and the number of maize plants carried after two successive thinings out, first fixed at 36, after a few weeks only amounts to 24. This figure is not large, but is sufficient to follow attentively the development of each plant. This is an advantage which is not to be overlooked.

The fertility of the soil, since 1900, was maintained by mineral fertilizer (ordinary commercial salts) comprising five mineral elements N, P, K, Mg, S; the others, including calcium, being present to a sufficient degree in the soil. This treatment met the purpose which was the production of maize ears to supply the seed utilized in my experiments with aseptic solutions.

About 1920, smut appeared on my plants introduced by commercial seed which I was obliged to purchase some years before. It spread to all the maize plants without any attempt being made to check its development, because it occurred at the proper time for close observation.

The first years were employed in following its development, establishing the means of ascertaining its presence in the tissues of the plant by cultures on solid media and disclosing the influence of atmospheric conditions on its development.

This advance work being accomplished, the field was divided into two plots of equal area; the one was given a complete nutrient solution, the other, the solution composed of the five elements indicated above. It was justifiable to suppose in fact, that the soil was deficient in the elements utilized by the plant in minimum doses, after 30 years continued cultivation to maize.

Moreover, the dwarf bean which was cultivated with the maize as an intercalary crop, from the first years of study expressed this deficiency by a disease of the stalk, disease due to various fungi, with a *Botrytis* and a *Verticillium* predominating, associated with bacteria.

The nutrient salts employed in the form of solutions double the concentration of that indicated earlier on, were given in four applications: the first before ploughing, the second after ploughing, three or four days before sowing, the third at the onset of flowering, the fourth after fecundation, in all corresponding to 400 kg. of sodium nitrate per hectare and the remainder in the proportions indicated in the table given on p. 21 of the February issue of this *Bulletin*.

From the early years an appreciable advantage was obtained in the plot which received the complete solution; this advantage, however, was gradually reduced because the salts employed supplied the soil, in the form of impurities, that which was deficient. The same supply naturally also existed before the appearance of smut, but the mineral fertilizers were much more reduced.

Another result, no less interesting, with this method of fertilizer application is the marked earliness of the plant. Sown about May 15 each year, the maize arrived at maturity before the end of September, 15 days to three weeks before the crops in the maize regions (Savoy, Dauphiny and Languedoc).

As the question stands at present, the following conclusions may be drawn:

In a heavily contaminated soil where the smut spores are maintained by annual crops of maize, infection of the seedlings occurs during germination; the parasite is localized in the first node of the stem and attains all the parts of the plant assembled together in the embryonic state.

If germination takes place rapidly owing to favourable weather which continues throughout the season, the effects of the disease pass unnoticed; all that can be remarked is that the adult leaves of the plant the most affected by the first infection, show a sort of mosaic formed of circles more discoloured in the centre, 1 to 5 mm. in diameter, spots more or less numerous according to the seriousness of infection. These spots are not specific, any common microbe may accidentally give the same symptoms; if there are good grounds for attributing them to *Ustilago*, it is because they can develop into small tumours when atmospheric conditions are unfavourable to the plant.

When germination coincides with unfavourable atmospheric conditions, infection is much more severe; the tendency to branching from the first node of the stem, the appearance of parchment-like spots on the first leaves, the partial congealing of the parenchyma and sometimes the formation of small swellings on the sheaths are the revealing symptoms, but not all are specific. The seedlings which show these symptoms are removed on thinning out and serve for control tests on solid nutrient media. Those which appear normal are retained; they may also, at first, be considered as contaminated. The return of normal weather conditions, I repeat, checks the development of the fungus and, if these conditions continue, the plant grows without difficulty.

If a period of unpropitious days occurs, the parasite develops insidiously; it takes advantage of the receptive state of the plant to establish foci of pullulation which the return of warm and sunny days suddenly makes evident; the smutty swellings become apparent; it is at the flowering season, when the plant has attained its full development, that they acquire a considerable size. The sap as yet containing no antimicrobial substances, feeds the fungus instead of checking its development. By its suddenness and rapidity, its development may be compared to the springing up of mushrooms in the woods after a heavy downpour. From day to day, the dormant buds come to life in the axils of the leaves and may attain within a few days, the size of a fist. The male inflorescences sometimes bear axes of female flowers alternating with axes of male flowers, both being more or less smutty.

If it is recalled that many cryptogamic diseases of annual or perennial plants present this ' explosive ' development under the influence of the same weather conditions, the following basic conclusion may be drawn:

Microbial diseases are occasional diseases which favour a receptive state of the plant caused by atmospheric conditions, the mode of action of which on the physiological properties of the cellular sap I have indicated.

An interesting deduction results from this conclusion: it is imagined that the sole means the plant has to check the development of the parasite is the rapid production of antimicrobial substances which have disappeared from the sap, in other words, it is a very considerable photosynthetic activity. It is the high yielding variety, therefore, which primarily is the most resistant ot microbial infection.

The resistance to cryptogamic diseases factor has always attracted the attention of plant breeders who have created hybrids of *Vitis vinifera* which are resistant to mildew but which, at the same time, are high yielders.

These resistant hybrids are not refractory to mildew and the manner which the mildew develops on the leaf is very suggestive. The colonies of the parasite are limited to the smallest islets of the parenchyma formed by the finest ramifications of the nervures. During very wet summers when copper sulphate appears to lose all effect on the development of the fungus, the spots multiply and form a veritable mosaic; the leaf does not wither however; it continues its work of photosynthesis, and the bunches remain intact. It is not unusual to see, after a very rainy summer, hybrids bearing a full crop besides non-resistant plants having neither leaves nor fruit.

Resistant hybrids possess the property of elaborating rapidly antimicrobial substances; ordinary thinning out is enough for them to recuperate an adequate immunity, so well that the mycelium of the parasite which manages to penetrate into the parenchyma cannot cross the small vascular bundles in which the antimicrobial compounds circulate. The development of the disease is quite different, as is known, in non-resistant varieties. The spot produced by only one germ may spread over a large part of the leaf; two or three colonies destroy it.

Thus, in the same vineyard, the clearest possible demonstration is given of the apparent mechanism of the protective reactions which are produced in the cell under the influence of solar radiation.

(*To be continued*).

LEGISLATIVE AND ADMINISTRATIVE MEASURES

Germany. — A Ministerial Circular of November 4, 1941, relative to the use of hydrocyanic acid gas combines in a single text, with a view to standardizing practical application, the provisions of the Ordinances dated March 25, 1931, November 29, 1932 and May 6, 1936 [see this *Bulletin*, 1936, No. 8, p. 173] regarding the use of violent poisons in pest control. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. Februar 1942, Bd. XIV, Nr. 1, S. 3-15).

*** A Circular dated November 6, 1941, extends to Ostmark and to the Sudeten district the provisions of the Circular of January 28, 1938 [see this *Bulletin*, 1938, No. 7, pp. 147-148] relative to the destruction of barberry [*Berberis vulgaris*]. (*Ibid.*, S. 2).

*** An Ordinance of November 14, 1941 regulates the fees to be collected in regard to the official supervision of nurseries as established by the Decree of November 21, 1939 [see this *Bulletin*, 1940, No. 5, p. 103] relative to the control of the San José scale [*Aspidiotus perniciosus*]. (*Ibid.*, S. 2-3).

Germany (Alsace). — Ordinance of October 14, 1941 prohibits the establishment of vineyards in districts other than those designated as wine-growing districts by the competent authority.

The Ordinance also gives a list of the vine varieties which, from the year 1943, will be authorized for cultivation. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. Februar 1942, Bd. XIV, Nr. 1, S. 18).

Germany (Protectorate of Bohemia and Moravia). — The Ministerial Notification No. 1023 of September 2, 1941 comprises a list of chemical preparations and indicates the conditions to which they must comply as regards their content in active elements and their external form and presentation.

It is a question of ' simple substances ' as considered by the Decree of December 5, 1940 containing new provisions relative to the control of and trade in the preparations intended for the protection of plants and plant products against noxious pests [see this *Bulletin*, 1941, Nos. 7-8, p. 142]. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. Februar 1942, Bd. XIV, Nr. 1, S. 21-25).

*** Ministerial Notification No. 233 (Chem. 39), dated January 6, 1942, makes the sale of copper sulphate for use in the control of pests of fruit and vine crops, of hops, potatoes and beets, subject to the presentation of a purchase permit (' Bezugschein '). The said Notification contains detailed provisions regulating the obtaining and operation of the permit in question. (*Ibid.*, S. 26-27).

Germany (Western Prussia - Dantzig District). — By Ordinance dated December 18, 1941, the control of suckers, scale insects and other pests of fruit crops is made compulsory. The owners and usufructuaries are required during the winter to treat all fruit trees and shrubs with carbolineum or some other means of control recognized as being effective by the central Plant Protection Service. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. Februar 1942, Bd. XIV, Nr. 1, S. 17).

Germany (Government General). — A Decree of July 21, 1941 establishes the modalities to be fulfilled by those desiring to take up work regarding the control of parasites and exercise the calling of control operator. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. Februar 1942, Bd. XIV, Nr. 1, S. 19-20).

Chile. — Decree No. 438, dated July 9, 1941, substitutes Decree No. 346 of April 10, 1940 [see this *Bulletin*, 1941, No. 1, p. 8] establishing the rate to be charged for crop disinfection work on the farms. (*Diario Oficial de la República de Chile*, Santiago, 25 de septiembre de 1941, año LXIV, núm. 19.069, págs. 3006 a 3008).

Colombia. — Decree No. 560 of March 24, 1941 establishes the measures to be adopted, with a view to the sanitary protection of potato cultivation in the Departments of Caldas and Tolima, against the ' gusano blanco perforador de la papa ' (*Trypopremnon* sp.). (*Diario Oficial*, Bogotá, 31 de marzo de 1941, año LXXVI, núm. 24625, pág. 1122).

Denmark. — Decree No. 504 of December 9, 1941 modifies the Decree No. 45 of February 28, 1931 relative to the toxic substances employed in the control of plant diseases. (*Lovtidenden A.*, København, 20. December 1941, Nr. 76, sid. 1549).

Morocco (French Zone). — The Vizirial Decree dated December 12, 1941 (23 kaada 1360), supplementing the Vizirial Decree of May 17, 1933 (22 moharrem 1352) [see this *Bulletin*, 1933, No. 9, p. 207] fixing the rate of the fee for cost of sanitary inspection for the import into French Zone of Morocco of plants, parts of plants or plant products, establishes that exemption is made in the case of plant products originating in the French Zone which, dispatched to France, are returned to Morocco because not accepted for shipment at an Algerian port. (*Bulletin Officiel*, Rabat, 9 janvier 1942, XXXI[e] année, n° 1524, p. 25-26).

*** The Vizirial Decree of December 31, 1941 (12 hija 1360) modifies the Vizirial Decree of August 1, 1936 (12 joumada I 1355) [see this *Bulletin*, 1936, No. 10, p. 227] relative to the application of sanitary measures to potatoes, tomatoes and eggplants on their entry into the French Zone of the Sherifian Empire.

It establishes, *inter alia*, that consignments of tomatoes, eggplants or potatoes intended for the French Zone of the Sherifian Empire or passing through the said zone, may only be allowed if packed in new packing material. As a temporary measure, for the duration of hostilities the Plant Protection Board may authorize the importation of these plant products in second-hand packs, if it is considered that such importation may be made without any danger. The said Board may, in this case, prescribe any sanitary measure considered advisable, such as the re-packing of the consignment at the Moroccan port or frontier station where imported. (*Ibid.*, 30 janvier 1942, n° 1527, p. 84-85).

*** A Decree of January 3, 1942 authorizes the destruction of boars which are causing serious damage in the crop lands in the Rabat region. (*Ibid.*, 23 janvier 1942, n° 1526, p. 68-69).

Peru. — A Resolution of August 8, 1941 suspends the application of the Resolution of July 19, 1941 [see this *Bulletin*, 1942, No. 1, p. 4] regarding the control of the ' pasmo ' disease of flax [*Sphaerella linorum*] and authorizes the trade in and utilization of the linseed harvested in the Department of Cajamarca provided that the seed is previously disinfected under the supervision of officers of the Division of Agriculture and Animal Husbandry.

Any small sowings which may have been made with seed obtained from the aforesaid Department and not previously disinfected must be destroyed by the growers themselves who, if this operation is carried out without delay, will be indemnified by the Division of Agriculture and Animal Husbandry. (*La Vida Agrícola*, Lima-Perú, septiembre 1941, vol. XVIII, núm. 214, págs. [731] a 733).

Portugal. — ' Portaria ' No. 9.961 of December 16, 1941 makes compulsory the control of pear scab (*Fusicladium pirinum*), the codling moth (*Laspeyresia* [*Cydia*] *pomonella*), peach leaf curl (*Exoascus* [*Taphrina*] *deformans*) and other diseases or pests prevailing in pomaceous and drupaceous orchards in the parishes of Colares and S. Martinho, municipality of Sintra. (*Diário do Govêrno*, Lisboa, 16 de dezembro de 1941, I série, núm. 292, pág. 1349).

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